

The Design and Implementation of a QR Code for Contactless Data Collection

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ABSTRACT

The Design and Implementation of a QR code for Contactless Data Collection is another advancement for the inevitable destiny of how we exchange information as a comprehensively organized society. This system eases and streamlines the process of information gathering through the use of QR codes and mobile scanners for registration, individuals can register from their comfort zone, fill the necessary forms and using this same system, appointments for capturing (biometrics) can be scheduled.

1. INTRODUCTION

Data collection is the process of gathering and measuring information on targeted variables in an established system, which then enables one to answer relevant questions and evaluate outcomes (M. Caddrick et al., 2003). As customers having the stress of always refilling one same form every time. Organizations are looking for a contactless method to collect data from customers.

It is in our nature as humans to try to improve the quality of all elements of our everyday life, including convenience, and this applies equally to the registration process. Some of the most frequent registration methods include filling a bank opening form to open a new account, filling of a withdrawal form and so many more but this project only deals with the filling of a bank opening form. The introduction of such facilities was on the horizon due to plainly detectable security reasons and the stress of always filling forms every time a new bank account is needed (Qadeer et al., 2013).

Today, it is unarguable that, while these registration methods have provided solutions to some of the concerns, they also have their fair share of disadvantages. Lack of a mobile device, network difficulties and so on are examples of such drawbacks. As the world changes, the need to strive for convenience and provide answers to such problems becomes increasingly crucial.

Thankfully, this doesn't have to cause headaches. You can make it seamless for customers. All you need to do is use a QR code for a banking opening form, which entails every detail necessary and having a great security measure. The QR - which stands for "quick response" - code is basically a barcode but while the barcode holds information horizontally, the QR code does so both horizontally and vertically (Gandhi et al., 2014). This enables the QR code to hold over a hundred times more information and as a result of these flaws, there is a clear need for a more efficient and secure registration method adopting the use of dynamic Quick Response Codes.

2. PROBLEM STATEMENT

An individual applying to open a bank account needs to fill a form, when in the bank, the individual encounter issues such as network related problems which lead to delay of registration, forgetting some important documents needed to register and so many more. Students are also unable to register because of the stress that comes with it like queuing to register and other related issues which is a major source of anxiety so instead of manually filling it in the bank, a unique QR code is generated for the form needed by the bank and once the bank scans the code the filled form is automatically filled with the present information and the response is sent directly to the form creator (i.e., the bank). Measures will be

made to restrict the kind of information sent and who sees the information. Implementing a system like this will ensure a good security for data.

3. AIM

The aim of this study is to develop a registration system that will allow individuals open bank accounts as many times as they want and with the use of this system, it will be easy, fast and stress free.

The specific objectives are to:

1. Design and build a platform to configure the client-side and server-side environments to support two interfaces, one for the user and the other for the bank.
2. Implement the QR code for data collection.

4. REVIEW OF CLOSELY RELATED WORKS

4.1 FEASIBILITY OF USING QR CODE FOR REGISTRATION AND EVALUATION OF TRAINING AND ITS ABILITY TO INCREASE RESPONSE RATE BY ELWIN AJEET MASIH (2022)

QR codes were developed by Denso Wave in 1994, initially to track car components during manufacturing. Since the evolution of smartphones with cameras, QR codes got more attraction and were applied to a wide range of commercial applications such as marketing, social media, and more recently QR codes have generated interest for their use in education, presenting an opportunity to excite and engage learners in a way the teachers were unable to thus far. Healthcare education is evolving rapidly to integrate new technology, ranging from virtual delivery of courses to using QR codes to access learning material, register attendance, and gather evaluations. Taking learners' attendance during each class has been time-consuming using the traditional method of signing the register. It has been more frustrating for learners; queuing and waiting for their turn to sign the register, especially when following social distance rules during the COVID-19 pandemic.

The COVID-19 pandemic has proven itself as the biggest threat in the living human memory affecting health and wellbeing and the economy. The pandemic has affected the clinical practice within the healthcare and this has not been different in healthcare education and training. Where COVID-19 affected life in its entirety, it has also affected the course attendance registration process. The researcher noticed a considerable increase in time consumed for signing the attendance register as compared to pre-COVID, as well as frustration among learners. The process of obtaining physical signatures of attendees to record attendance was robbing the training time. It had become conspicuous to the researcher that there was an absolute need to find an alternative to the traditional attendance registration process. Masih recommended the use of QR codes to obtain attendance registers that convinced the researcher to pilot and evaluate this method of obtaining attendance registers. Modular Object-Oriented Dynamic Learning Environment (MOODLE) is used by the researcher's employing Trust for its electronic learning courses. All staff members of the Trust have access to MOODLE and are familiar with using the platform. Therefore, MOODLE was used to create QR Code registers. MOODLE was given preference over other electronic registration platforms, such as Jot form and Google forms, to minimise the confidentiality breach of learners' personal data.

4.2 E-COMMERCE AND ONLINE PAYMENT IN THE MODERN ERA BY MUKHERJEE AND ROY (2017)

E-commerce is the cutting edge of today's commerce, according to this report. It encompasses not only online purchasing but also all forms of transactions and computerized business-to-business relationships.

It is an electronic communication system that allows business partners to share information in order to detect trade aims. It is a type of current trade system in which merchants, consumers, and others use high-speed computer networks to reduce service costs, improve the value of goods and services, and speed up service delivery. It aids in the trading procedure over computer networks very quickly. E-commerce is now employed in all aspects of business, from product design to customer support.

Essentially, e-commerce is a type of business process that involves interacting with customers quickly, such as online advertising, online payment, online customer service, order tracking, and product exchange. It can also lower carrying costs and order-related solutions, as well as service fees and order management costs. It helps rural areas to connect with a large number of suppliers, distributors, and trading partners. Essentially, e-commerce entails conducting business as usual through the internet. This research looks at customer trust in an online business-to-consumer (B2C) setting. The internet has had a remarkable impact on the evolution of the trading process.

The study emphasizes the advantages of e-commerce after a company has advertised their product via internet advertising. E-commerce is a cutting-edge business model. It can be utilized at any time and from any location in the globe, i.e., the global market, right away. It's a mechanism for buying and selling things through the internet. To use, all you need is an internet connection, a computer, and some expertise. Information can be shared with partners in a matter of seconds.

A fundamental part of the electronic commerce process is the generic framework. The elements of e-commerce must be defined and examined. The role of e-commerce in manufacturing, retailing, and service is investigated, and a common framework is proposed to describe the role of e-commerce in various areas of an organization. In e-commerce, trust is crucial. Instead of using traditional payment methods such as cheques or liquid cash, we can now employ a variety of cashless transactions, commonly referred to as e-payment. People can use this e-Payment technique to pay for goods and services through the Internet without having to use cash. The E-payment system has several key purposes, including transaction security, convenience, and transparency, as well as time and cost savings.

Debit/ATM card, credit card Net Banking, Smart Card, PayPal, Mobile Wallet or e-Wallet Electronic payment solutions include Payment Wall Method and Google Wallet.

The paper goes on to discuss the value of electronic data interchange. Electronic Data Interchange (EDI) refers to the electronic exchange of documents and information between business partners. Nowadays, it is primarily utilized in business-to-business electronic commerce. Costs and effort associated with trade partner conversion have decreased, and business processes have improved. Customer-supplier relationships may become more collaborative and trusting. Another benefit is the ability for separate computers to speak with each other.

E-business is a simple business enterprise with a huge amount of cash. It primarily focuses on new market trends and the global economy, as well as new and better corporate policies, new and updated models, and significant development possibilities. Many financially troubled businesses have attempted to boost their profits by utilizing web marketing. The majority of the company refocuses on increasing property value by altering production speed and service quality.

One of the goals of this study, which is to limit human contact in order to reduce the propagation of viruses and also the security of payment systems, was not fully addressed, which is a gap in relation to the above-mentioned project. The research focused solely on e-commerce and e-payment systems.

4.3 A FRAMEWORK TO PREVENT QR BASED PHISHING ATTACKS BY DAYARTNE (2016)

This study looks into QR-based phishing attacks, which are a newly adopted intrusive tactic, and how user-centric security education approaches employing game-based learning would improve awareness and avoidance behavior of QR-based phishing assaults.

The goal of this study was to find and develop a new game design framework that incorporates quantitative and qualitative analysis that can be used to reduce the risk of QR-based phishing attacks. Qualitative analysis method was used to conduct this research using the knowledge gained from reviewing previous work. There was a laboratory experiment to identify and comprehend the users' perspective on the problem. The study enlisted the help of about 50 people who were willing to participate voluntarily. They were given a questionnaire to fill out in order to determine what motivates them to scan QR codes in public.

A quantitative study was carried out in the second phase to identify the victims of QR code-based phishing assaults. A set of QR codes was posted in public places, with some of those QR codes being manipulated to route visitors to phishing websites, where simulated phishing assaults would be carried out while the users' behavior was carefully monitored. Users were asked to scan QR codes without being told what will happen if they don't.

The major goal of this phase was to identify and design a set of rules for secure QR code usage based on the user experiment results, identifying main concerns/usages that was used to secure QR code usage in terms of phishing attacks. Based on the principles identified in the previous step, the next phase was to design a framework to avoid QR-based phishing assaults. With the help of security and usability experts in the field, the guidelines were improved and fine-tuned before being used in the framework.

In the final phase, an educational game was constructed utilizing the identified framework in order to enhance awareness and avoidance behavior of QR-based phishing assaults, and it was analyzed to determine the framework's consistency.

In conclusion, the study's flaw is that no security measures were offered; instead, the author was merely conducting a poll to learn about user reactions.

5. METHODOLOGY

The real system under development was dissected into several high levels of functionality and each part of the system has a single, distinct goal, and only interacts with other crucial parts when it is necessary to do so.

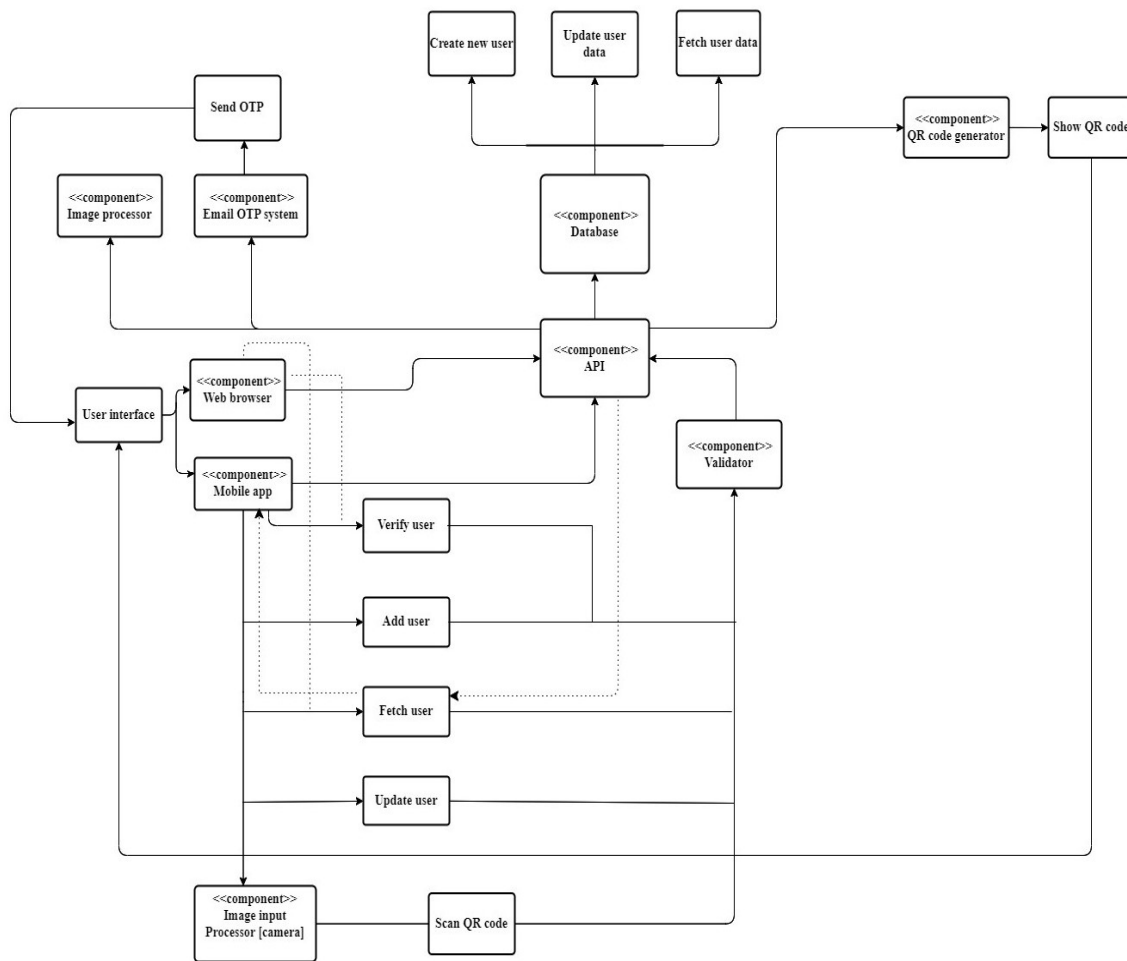


Figure 1: Component Diagram

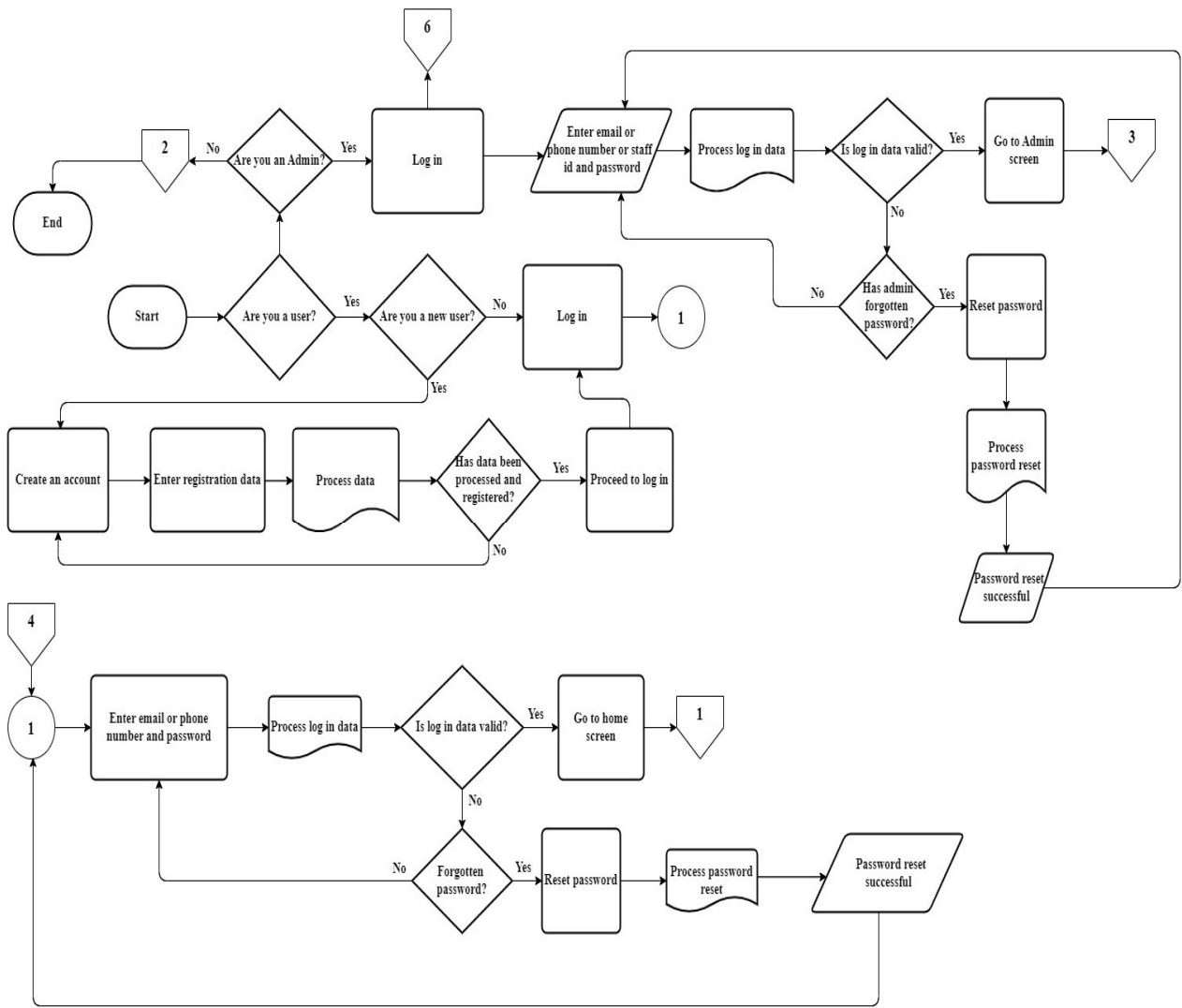


Figure 2: Flowchart 1

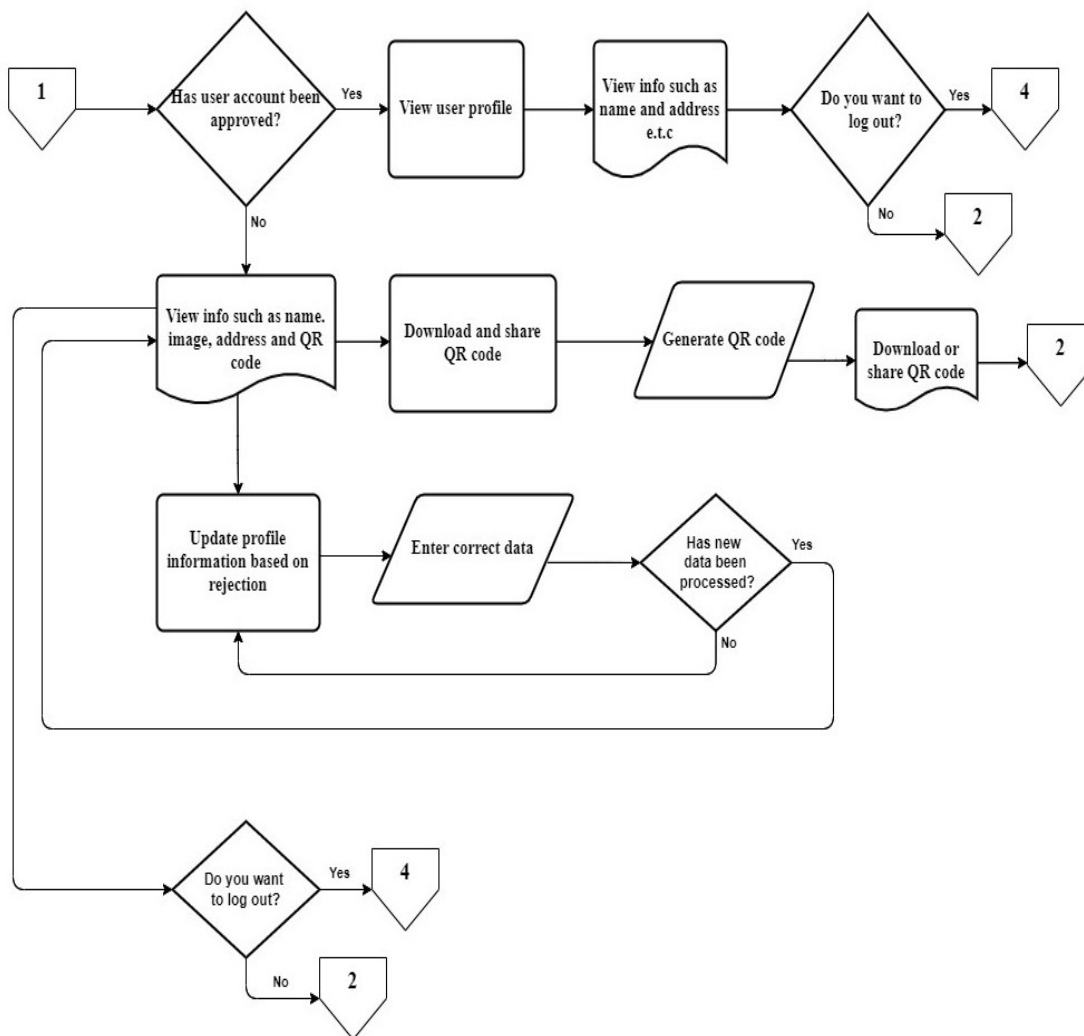


Figure 3: Flowchart 2

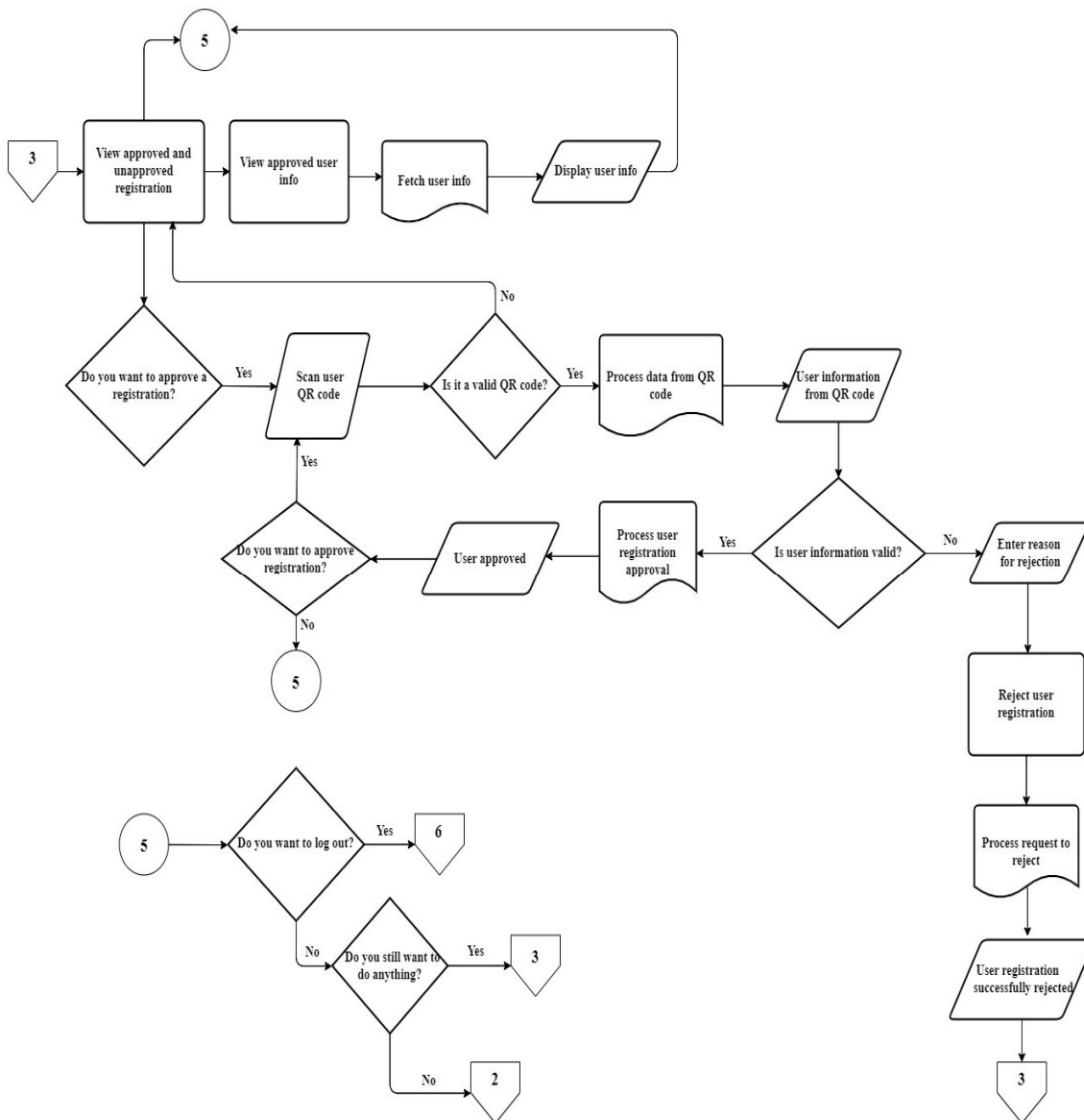


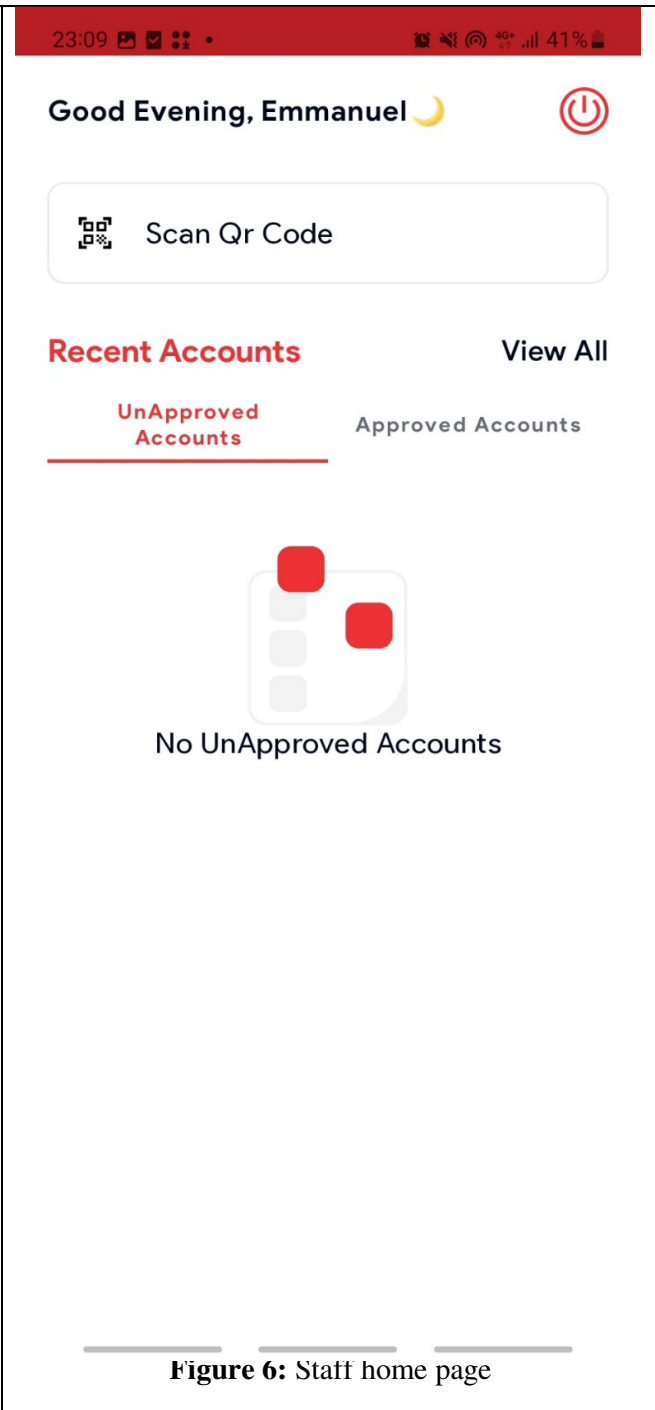
Figure 4: Flowchart 3

6. DEVELOPMENT TOOLS

- Visual Studio Code: Visual Studio Code is a quick yet capable source code editor that runs on Windows, macOS, and Linux. It offers built-in support for JavaScript, TypeScript, and Node.js and a robust ecosystem of extensions for other languages and runtimes (including C++, C#, Java, Python, PHP, Go, and NET).
- Web browser: This is used to access information on the World Wide Web. When a user requests some information, the web browser fetches the data from a web server and then displays the webpage on the user's screen.

- Android studio: This is the official integrated development environment (IDE) for Android application development.
- Postman: This is an API Platform used to design, build, test and iterate APIs.

7. IMPLEMENTATION



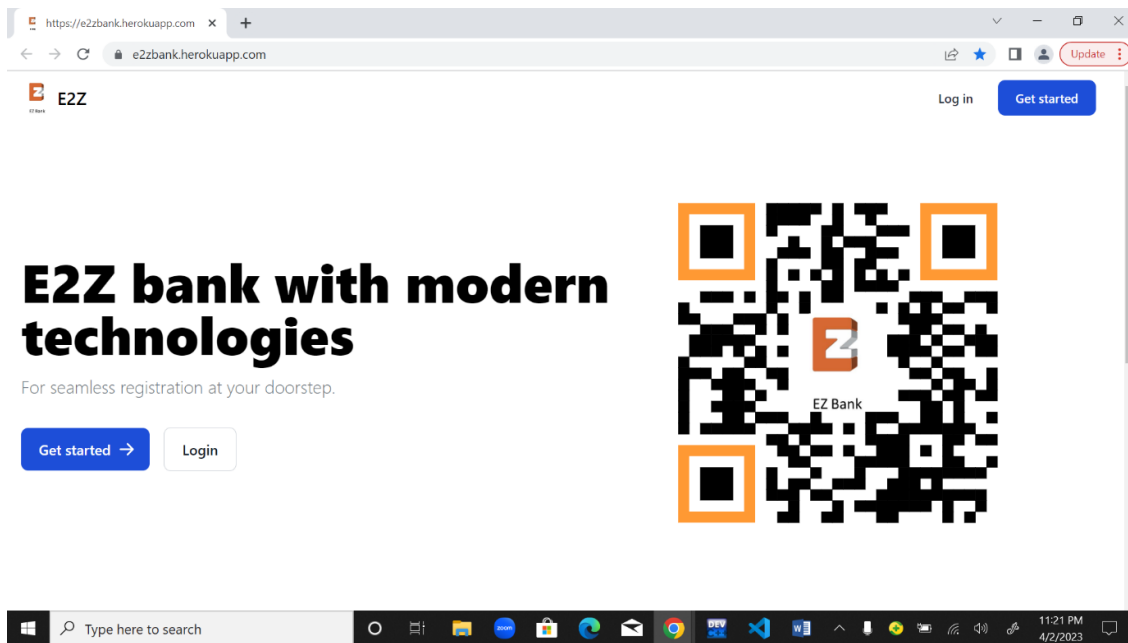


Figure 7: Landing page

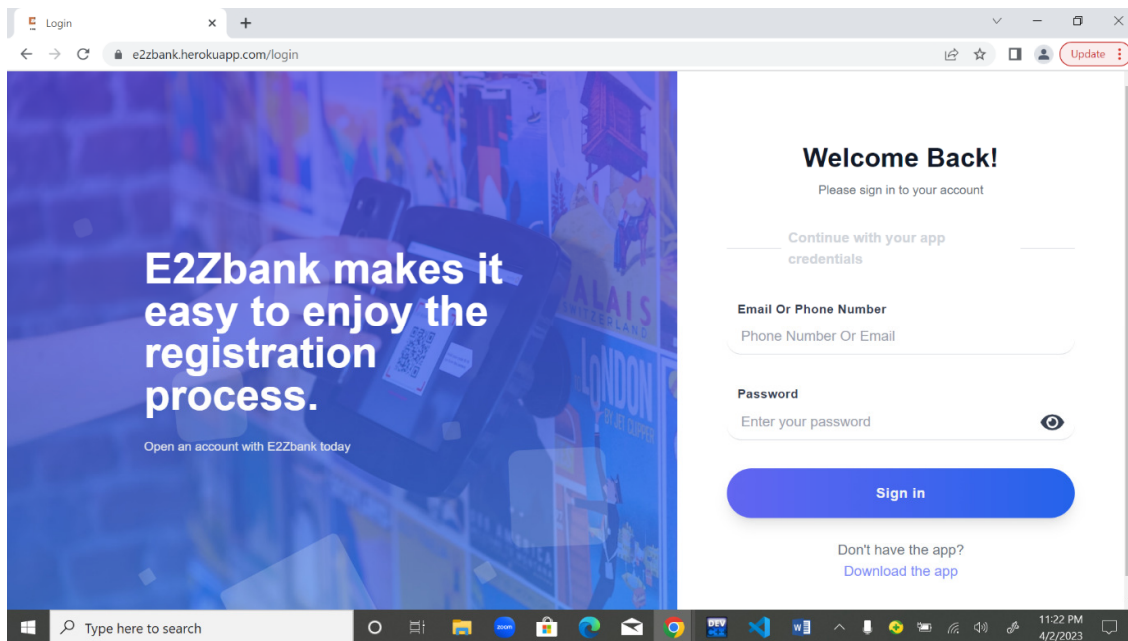


Figure 8: Login page

8. CONCLUSION

The project proposes a solution that can significantly simplify the process of information gathering. The use of QR codes and mobile scanners can save time and reduce errors in data entry. Additionally, measures to restrict the kind of information sent and who sees the information can help ensure privacy and security.

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REFERENCES

- [1] Alipay (2021). Third-Party Merchant QR Code Payment Solution.B. (2017).
- [2] QR Code API - Dynamic & Static. Beaconstac.
- [3] Chen, L. (2013), Characterizing architecturally significant requirements, Boston.
- [4] Dayaratne, T. (2016). [PDF] A Framework to Prevent QR Code Based Phishing Attacks | Semantic Scholar. Semantic Scholar.
- [5] Dongre, N. (2019). [PDF] QR Code Based Secure Billing System for Shops using Cued Click Points | Semantic Scholar. www.semanticscholar.org.
- [6] Mypeer (2010). Ethical considerations.
- [7] Brokaw, Stephen (2012). The expectation of Quick Response (QR) Codes in print media: An empirical data research anthology.
- [8] Dutson, Phil (2013). Creating QR and Tag Codes. The United States: Sams Publishing.
- [9] FreeQRcodes.Org (2014). A guide to generating QR Codes.
- [10] ISO/IEC (2005). Information Technologies-Automatic identification and data capture technique-QR Code 2005 bar code symbology specification.
- [11] Joy, A. K. T. J. V., Pattara, F. A., & Xavier, J. M. (2016). FLIPAY-QR Code Based Payment System. International Journal of Science Technology & Engineering, 2349-784
- [12] Kadam, S. (2019). QR codes and Cryptography - Medium.
- [13] Scott. (2020). How Do QR Codes Work? QR Code Technical Basics.
- [14] Stegner, C. (2021). HowContactless Tech and QR Codes Will Bring Us into The Future. Forbes.
- [15] Definition, Best Practices & More. (2020). Digital Guardian. What Is Data Encryption?
- [16] Wikipedia contributors. (2021). Error correction code.